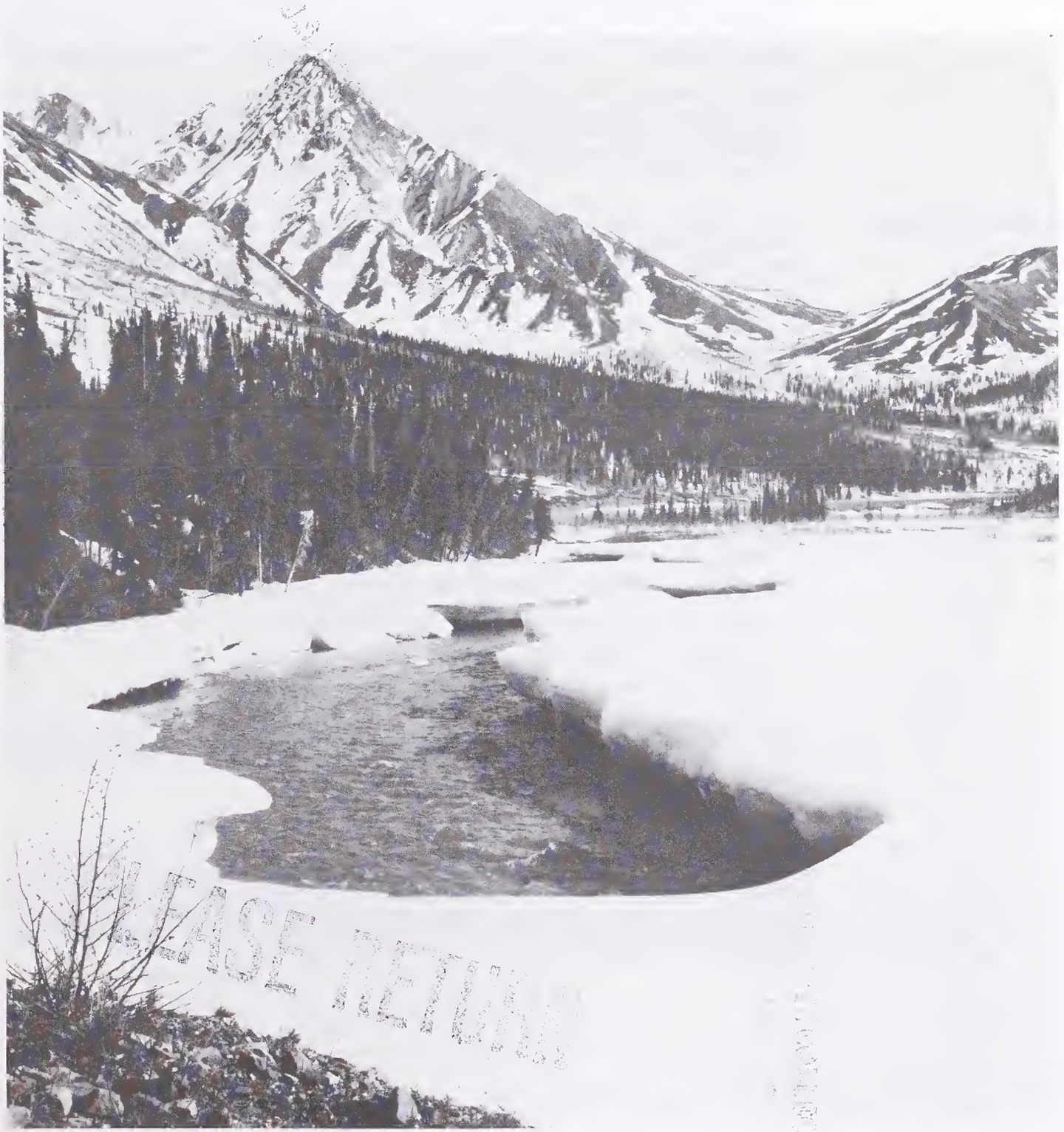
United States
Department of
Agriculture

**Soil
Conservation
Service**

**Bozeman,
Montana**

Montana
Water Supply Outlook

October 1, 1987



Foreword

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall. This snowfall accumulates high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are viewed in conjunction with snowpack data to prepare runoff forecasts. This report presents a comprehensive picture of water supply outlook conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data and narratives describing current conditions.

Streamflow forecasts are cooperatively generated by Soil Conservation Service and National Weather Service hydrologists. Forecasts become more accurate as more data affecting runoff becomes known. For this reason, forecasts are issued that reflect three future precipitation conditions — Below Normal, Average, and Above Normal. These forecasts are termed reasonable minimum, most probable, and reasonable maximum. Actual streamflow can be expected to fall between the lower and upper forecast values eight out of ten years.

Snowpack data are obtained by using a combination of manual and automated measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation, temperature, and other parameters are monitored on a daily basis and transmitted via radio telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

For More Information

Copies of Monthly Water Supply Outlook Reports and other reports may be obtained from the states listed below. Because of the limited space, snow survey measurements are not published in monthly reports. An annual snow survey data summary is published by the Soil Conservation Service for each of the western states. Historical snow survey data may be obtained at those same offices.

STATE	ADDRESS
Alaska	201 East 9th Ave., Suite 300, Anchorage, AK 99501-3687
Arizona	201 East Indianola, Suite 200, Phoenix, AZ 85012
Colorado	2490 West 26th Ave., Denver, CO 80211
New Mexico	517 Gold Ave. S.W., Room 3301, Albuquerque, NM 97102
Idaho	304 North 8th Street, Room 345, Boise, ID 83702
Montana	10 East Babcock, Room 443, Federal Building, Bozeman, MT 59715
Nevada	1201 Terminal Way, Room 219, Reno, NV 89502
Oregon	1220 Southwest 3rd Ave., Room 1640, Portland, OR 97208
Utah	4402 Federal Building, 125 South State Street, Salt Lake City, UT 84147
Washington	360 U.S. Court House, Spokane, WA 99201
Wyoming	Federal Building, 100 East "B" Street, Casper, WY 82601

In addition to state reports, a Water Supply Outlook for the Western United States is published by the Soil Conservation Service and National Weather Service monthly, January through May. Reports may be obtained from the Soil Conservation Service, West National Technical Center, 511 Northwest Broadway, Room 547, Portland, OR 97209.

Published by other agencies:

Water Supply Outlook Reports prepared by other agencies include: California — Snow Survey Branch, California Department of Water Resources, P.O. Box 388, Sacramento, CA 95802; British Columbia — The Ministry of Environment, Water Investigations Branch, Parliament Buildings, Victoria, British Columbia, V8V 1X5; Yukon Territory — Department of Indian and Northern Affairs, Northern Operations Branch, 200 Range Road, Whitehorse, Yukon Territory, Y1A 3V1; Alberta, Environment Technical Services Division, 9820 106th St., Edmonton, Alberta T5K 2J6.

Montana
Water Supply Outlook

and

Federal – State – Private
Cooperative Snow Surveys

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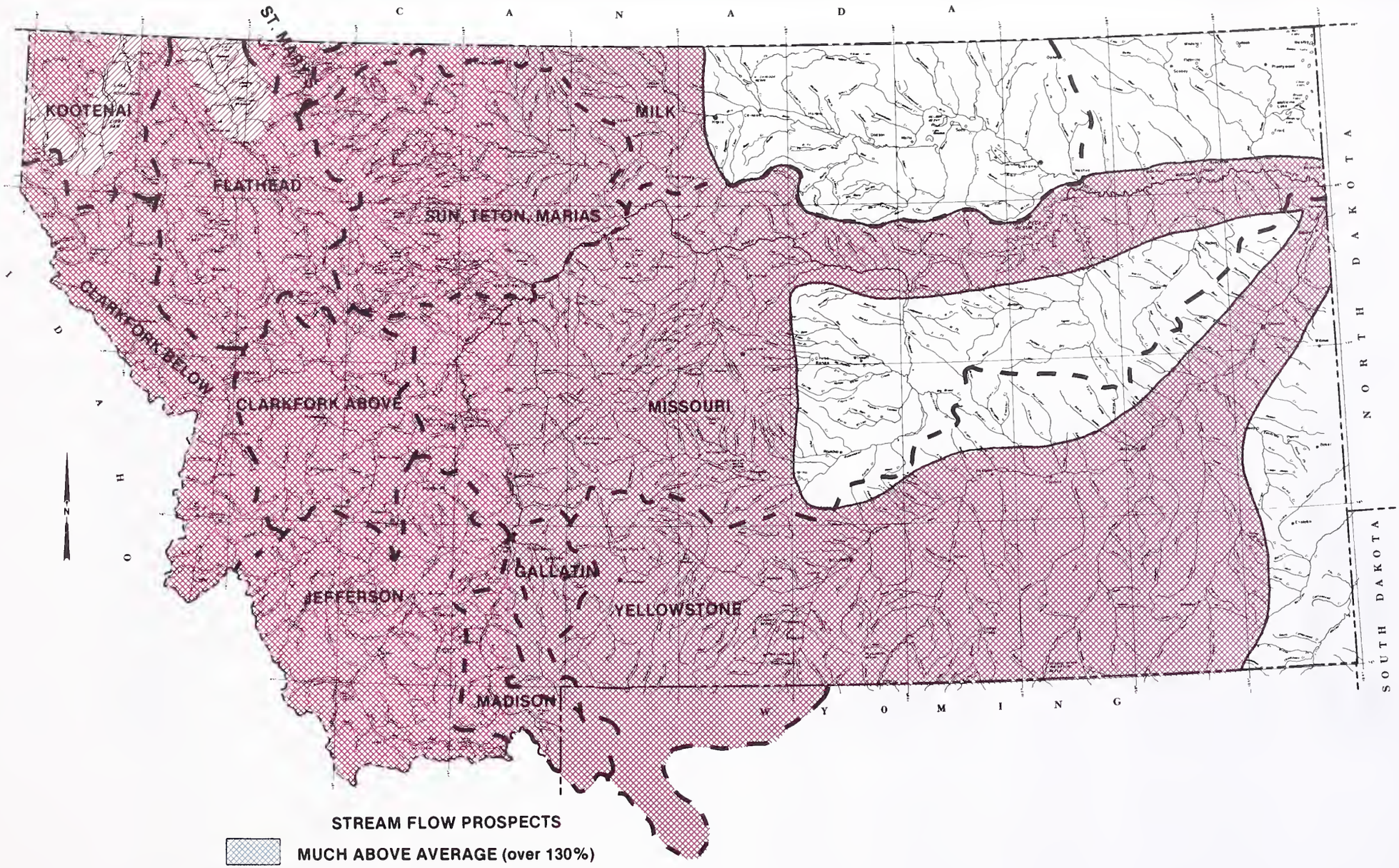
U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



STREAMFLOW PROSPECTS FOR MONTANA

Spring and Summer Period

STREAM FLOW PROSPECTS

- MUCH ABOVE AVERAGE (over 130%)
- ABOVE AVERAGE (110-130%)
- NEAR AVERAGE (90-110%)
- BELOW AVERAGE (70-90%)
- MUCH BELOW AVERAGE (below 70%)
- NOT FORECAST

Provisional 1987 April-September Runoff

0 25 50 75 100 MI

0 50 100 150 KM

SOURCE:
Information provided by SCS Snow Survey Personnel.

JUNE 1985 4-R-39296

USDA SCS FORT WORTH, TEXAS 1985

GENERAL OUTLOOK

SUMMARY:

This year's weather seemed to be a multitude of extremes rather than any consistent pattern. Precipitation increments were generally quite dry or quite wet with more dry periods than wet ones. Temperatures were quite warm throughout the winter and spring, a little cooler through the summer and again quite warm in the fall. Spring came 4 to 6 weeks earlier than normal and irrigation was needed much earlier this spring. This year's growing season may be one of the longest recorded in recent years. September usually brings cool and wet weather but this year it was dry and warm. Streamflows for the April-September period as well as peak flows were below average across all of Montana. An unusual year to say the least.

SNOWPACK:

The early season started out with a dry October followed by a wet November. The next three months were dry. By March 1, snowpack percentages fell to well below average over most of the state. March moisture was above average in some areas. Snowpack percentages showed a small increase but were still well below average on April 1. Spring came 4 to 6 weeks early. April brought a significant decrease in snowpack. April is a month that usually has stable or increasing snowpack. By May 1, the snowpack was less than one-half percent of average over the majority of the state. By June 1, most of the snow had melted. Many snow courses across the state set new record low snow water contents in the later snow accumulation months.

PRECIPITATION:

Water year precipitation, October 1 through September 30, was below average in all mountain drainages. However, monthly totals were quite variable. The season started off dry. By November precipitation was heavy. The next three months were generally below average. Some drainages had average or a little above average amounts in March. The next three months continued the dry pattern followed by a very wet July. August precipitation was above average east of the Divide while in the mountains west of the Divide precipitation was below average. September was dry over over the entire state.

Valley precipitation during June was average or a little above average in the extreme southwest corner and in parts of the north-central and northeastern areas. The remainder of the valley areas recorded below or much below June moisture. July followed the mountain pattern with nearly all areas showing well above average totals. In August, valley precipitation was quite variable. Much of the central and

northeastern divisions reported below average precipitation. The western and southwestern divisions generally had average or a little above average valley moisture. Most north-central, south-central, and southeastern stations reported well above average precipitation. Very little valley precipitation was recorded in September in the western half of the state with some precipitation occurring at stations in the eastern half.

Most mountain watersheds and many valley areas are reporting drier than normal soils due to above normal temperatures and lack of precipitation.

RESERVOIRS:

Most larger multi-purpose reservoirs have average or a little below average storage. Storage in reservoirs is generally near average but some are below and others are above October 1 levels. Only Lima Reservoir appears to be significantly lower than usual. Considering the low runoff year, carry over storage is quite good.

STREAMFLOW:

All streams reached their snowmelt peak about a month earlier than usual. The flows were quite low with some streams reporting record low peak flows. Many streams did not have flows much above base flow amounts and it appeared that low runoff and heavy irrigation demand would dewater many streams. However, rains returned to most of the areas in July and helped reduce irrigation demands and recharge soil moisture. Streamflow did not increase greatly but rivers and streams did have enough water to maintain flows and provide enough supplemental irrigation water to avert critical shortages. Moderate moisture continued into August and streamflows continued to hold up above critical levels. For the season most streamflow volumes were between 30 and 70 percent of average. The only area to report greater than 70 percent of average April through September runoff was the Kootenai River with much of its headwaters in British Columbia. Here, the runoff was a little above the 70 percent of average level.

Based on provisional data, the Flathead River tributaries had runoff a little below 70 percent of average while streams in the Clark Fork Drainage were in the 30 to 45 percent of average range. In the Missouri River headwaters, runoff was generally 40 to 65 percent of average. Downstream tributaries contributed flows between 30 and 65 percent of average. The Yellowstone River and its tributaries had April-September runoff between 45 and 55 percent of average.

1987 SNOW COVER COMPARISONS
(as a percent of average)

RIVER BASIN and/or SUB-WATERSHED	JAN 1	FEB 1	MAR 1	APR 1	MAY 1
COLUMBIA RIVER DRAINAGE					
Kootenai	88	79	73	79	51
Flathead	86	78	74	77	52
Upper Clark Fork	75	65	62	64	27
Lower Clark Fork	83	74	68	71	44
Bitterroot	67	67	64	63	30
MISSOURI RIVER DRAINAGE					
Jefferson	60	61	65	67	29
Madison	60	62	61	61	23
Gallatin	67	68	62	62	25
Missouri Main Stem	70	63	56	59	24
Judith-Musselshell	53	50	47	58	19
Marias-Teton-Sun	99	82	76	81	43
Milk	84	77	68	74	26
YELLOWSTONE RIVER DRAINAGE					
Yellowstone (above Bighorn)	72	69	61	66	35
Bighorn	86	78	76	79	47
Little Big Horn	77	78	71	79	48
Tongue	85	86	79	84	43
Powder	60	73	80	83	34
SASKATCHEWAN RIVER DRAINAGE					
St. Mary	96	85	74	79	52

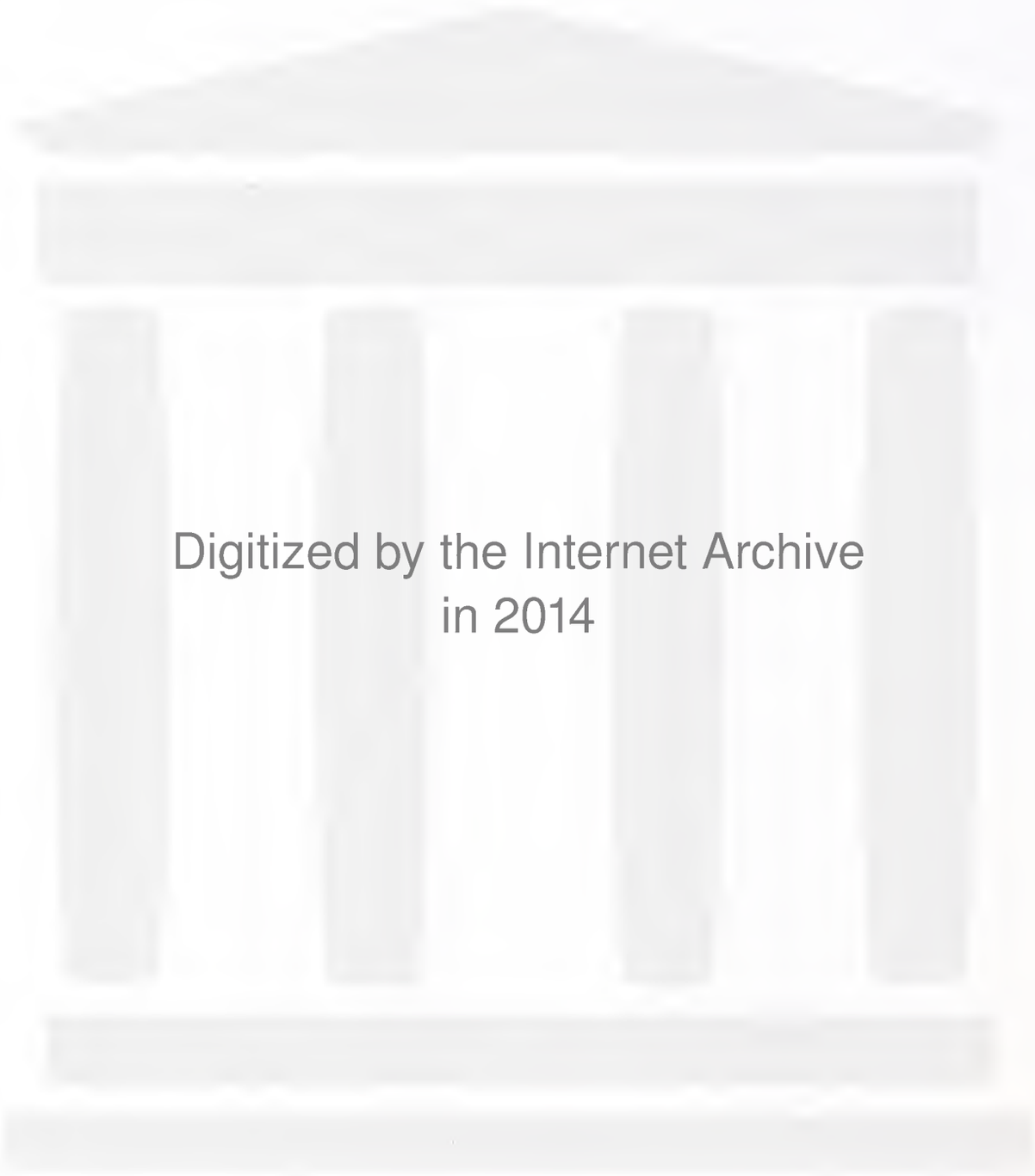
MOUNTAIN PRECIPITATION
1987 Water Year

PERCENT OF AVERAGE BY BASIN

	JUNE	JULY	AUG	SEPT	WATER YEAR OCT 1 THRU SEPT 30
KOOTENAI	51	181	84	41	80
FLATHEAD	60	201	119	24	79
CLARK FORK (ABOVE)	70	235	81	23	73
CLARK FORK (BELOW)	56	145	61	16	72
JEFFERSON	58	272	114	18	81
MADISON	51	215	112	15	70
GALLATIN	51	214	144	23	72
MISSOURI	43	221	69	44	73
SUN-TETON-MARIAS	68	390	115	12	88
ST. MARY/MILK	83	187	118	35	85
YELLOWSTONE	60	194	124	23	75

RESERVOIR STORAGE (Thousand Acre-Feet) End of Month September 30, 1987

BASIN OR STREAM	RESERVOIR	USEABLE CAPACITY	USEABLE STORAGE THIS YEAR	LAST YEAR	AVERAGE
	COLUMBIA				
Kootenai	Koocanusa	5,748.2	5,093.0	5,126.0	5,302.0
Flathead	Hungry Horse	3,451.0	2,682.0	2,995.0	3,175.0
	Flathead Lake	1,791.0	1,757.0	1,761.0	1,732.0
	Camas (4)	45.2	15.5	20.8	19.3
	Mission Valley (8)	100.3	12.7	23.3	27.2
Clark Fork	Georgetown Lake	31.0	26.2	30.5	28.3
	Lower Willow Creek	4.9	--	0.9	1.0
	Nevada Creek	12.6	1.3	--	4.2
	Noxon Rapids	334.6	324.0	324.4	324.7
Bitterroot	Painted Rocks	31.7	--	--	21.9
	Como	34.9	1.9	2.4	3.4
	MISSOURI				
Beaverhead	Lima	84.0	0	23.6	29.9
	Clark Canyon	255.6	143.0	137.7	124.8
Ruby	Ruby	38.8	7.0	11.4	12.1
Madison	Hebgen Lake	377.5	322.9	349.6	339.4
	Ennis Lake	41.0	37.3	37.3	36.7
Gallatin	Middle Creek	8.0	5.8	3.9	3.3
Missouri	Canyon Ferry	2,043.0	1,551.7	1,734.0	1.741.0
	Hauser & Helena	61.9	63.1	63.0	59.7
	Helena Valley	9.2	8.2	6.5	6.6
	Lake Helena	10.4	10.9	10.9	10.5
	Holter Lake	81.9	79.1	81.0	78.5
	Fort Peck Lake	18,910.0	15,764.0	15,690.0	16,050.0
Smith	Smith River	10.6	0	7.8	5.5
	Newlan Creek	12.4	8.9	11.3	10.0
Musselshell	Bair	7.0	.8	5.7	2.9
	Martinsdale	23.1	2.4	12.0	9.4
	Deadman's Basin	72.2	29.8	--	34.9
Sun	Gibson	99.1	31.2	30.3	29.2
	Willow Creek	32.2	23.7	25.0	19.2
	Pishkun	32.0	20.2	5.8	16.9
Marias	Lower Two Medicine	11.9	10.8	--	5.8
	Four Horns	19.2	27.2	--	11.6
	Swift	30.0	20.5	10.0	10.9
	Lake Frances	111.9	96.6	74.4	67.4
	Elwell (Tiber)	1,347.0	811.0	807.8	621.1
Milk	Beaver Creek	3.5	2.5	3.1	2.0
	Fresno	127.2	70.0	67.8	60.4
	Nelson	66.8	49.4	54.3	38.1
	HUDSON BAY				
St. Mary's	Lake Sherburne	64.8	32.7	21.9	8.8
	YELLOWSTONE				
Stillwater	Mystic Lake	21.0	18.8	18.6	19.5
Clark's Fork	Cooney	27.4	21.6	16.5	13.0
Tongue	Tongue River	68.0	--	16.1	23.5
Bighorn	Bighorn Lake	356.0	933.6	1,025.0	817.5



The Following Organizations Cooperate With The Soil Conservation Service In Snow Survey Work

Canadian

Department of the Environment
- Atmospheric Environment Service
- Water Management Service

British Columbia Ministry of Environment
- Inventory and Engineering Branch, Hydrology Section

Alberta Environment
- Technical Services Division

Federal

U.S. Department of Agriculture
- Forest Service

U.S. Department of the Army
- Corps of Engineers

U.S. Department of Commerce
- NOAA, National Weather Service
- National Environmental Satellite Service

U.S. Department of the Interior
- Bureau of Indian Affairs
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Bureau of Reclamation

U.S. Department of Energy
- Bonneville Power Administration

State

Montana Conservation Districts
Montana Department of Fish, Wildlife, and Parks
Montana Department of Natural Resources and Conservation
Montana Department of State Lands
Montana State University - Agricultural Experiment Station
University of Montana - School of Forestry

Private

Big Sky of Montana
Butte Water Company
Confererated Salish & Kootenai Tribes
Flathead Valley Comminity College
Montana Power Company
Pondera County Canal & Reservoir Company

Other organizations and individuals furnish information for the snow survey reports.
Their cooperation is gratefully acknowledged.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SNOW SURVEY UNIT
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